



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/596,644      | 06/20/2006  | Johannes De Wilde    | NL04 1251 US1       | 8785             |

65913 7590 03/24/2009  
NXP, B.V.  
NXP INTELLECTUAL PROPERTY DEPARTMENT  
M/S41-SJ  
1109 MCKAY DRIVE  
SAN JOSE, CA 95131

|          |
|----------|
| EXAMINER |
|----------|

HOLLINGTON, JERMELE M

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

2829

|                   |               |
|-------------------|---------------|
| NOTIFICATION DATE | DELIVERY MODE |
|-------------------|---------------|

03/24/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ip.department.us@nxp.com

|                              |  |  |  |
|------------------------------|--|--|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/596,644     | <b>Applicant(s)</b><br>DE WILDE ET AL. |  |
|                              | <b>Examiner</b><br>Jermele M. Hollington | <b>Art Unit</b><br>2829                |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 January 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 and 30-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9, 15-20 and 30-32 is/are rejected.
- 7) ☒ Claim(s) 10-14 and 33 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 June 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments filed January 26, 2009 have been fully considered but they are not persuasive.

a) The applicants' argue: *"The current application is a U.S. National Stage application. The drawing requirements for U.S. National Stage applications are identified in MPEP 1825 and labeling of figures as "Prior Art" is not required (see PCT Rule 11.11). Further, MPEP 1893.03(f) states that "[t]he USPTO may not impose requirements beyond those imposed by the Patent Cooperation Treaty (e.g., PCT Rule 11)." In view of the above, Applicants respectfully assert that labeling Figure 2 as "Prior Art" is not required in the current application."*

In response to the above arguments, the applicants are incorrect about the application. This application 10/596,644 is a U.S. Provisional Application where the rules for U.S. National Stage application (PCT case) do not apply to U.S. Provisional or Nonprovisional applications. Therefore, the examiner is maintaining the drawing objection as indicated below.

b) The applicants' also argue: *"Claim 1 recites "wherein the current sensing device is integrated in the semiconductor device where the current to be measured is generated and the current sensor is galvanically isolated from the conductive element" (emphasis added). In contrast, Daughton does not disclose a current sensing device that is integrated into a semiconductor device where the current to be measured is generated."*

In response to the above argument, the examiner would like to remind the applicants that any claim limitations that employ phrases of the type "wherein" are typical of claim limitations, which may not distinguish over the prior art. It has been held that the recitation that an element comprises "wherein" clauses to perform a function are not a positive limitation but only requires the ability to so perform. See also MPEP 2111.04. Furthermore, while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus

Art Unit: 2829

must be distinguished from the prior art in terms of structure rather than function alone. See MPEP 2114.

### ***Drawings***

2. Figure 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-9, 15-20 and 30-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Daughton et al (6300617).

Regarding claim 1, Daughton et al disclose [see Figs. 1A-2CCC] a semiconductor device (semiconductor 10) comprising a conductive element (combination of conductor coil 29 and bonding pads 30) and a current sensor (current sensor structures 24A-24D), wherein the current sensor (24A) is a magnetic current sensing device for sensing direct, varying or alternating

Art Unit: 2829

current flowing through the conductive element (29-30 see also Abstract), wherein the current sensing device (24A) is integrated in the semiconductor device (10) [see col. 10, lines 64-65] wherein the current to be measured is generated and the current sensor (24A-24D) is galvanically isolated from the conductive element (29-30) [see Abstract].

Regarding claim 2, Daughton et al disclose said current sensor (24A) is suitable for measuring current with a  $\mu\text{A}$  resolution.

Regarding claim 3, Daughton et al disclose the current sensing device (24A) comprises at least one TMR device (intermediate layer 18).

Regarding claim 4, Daughton et al disclose the current sensing device (24A) shares an MTJ stack (combination of items 15-22 in Fig. 2B) with an MRAM device (interconnecting network 14).

Regarding claim 5, Daughton et al disclose the MTJ stack (items 15-22) comprises: an electrically insulating material (intermediate layer 18) designed to form a magneto-resistive tunneling barrier, a pinned magnetic region (combination of layer 19 and pinning layer 20) positioned on one side of the electrically insulating material (18), the pinned magnetic region (20) having a magnetic moment vector adjacent the electrically insulating material (18) [see col. 13, lines 7-29], a nearly balanced free magnetic region (ferromagnetic strata 16 and 17) positioned on an opposite side of the electrically insulating material (18), the free magnetic region (16-17) having a magnetic moment vector adjacent the insulating material (18) and oriented in a position parallel or anti-parallel to the magnetic moment vector of the pinned magnetic region (19-20), the free magnetic region (16-17) including an artificial anti-

Art Unit: 2829

ferromagnetic layer material including N ferromagnetic layers which are antiferromagnetically coupled, where N is an integer greater than or equal to two [see col. 12, lines 1- col. 14, line 24].

Regarding claim 6, Daughton et al disclose the current sensing device (24A) has a free magnetic layer (ferromagnetic strata 16 and 17) which has an easy axis oriented to be substantially perpendicular to a magnetic field caused by current under measurement [see col. 12, line 1- col. 13, line 29].

Regarding claim 7, Daughton et al disclose the current sensing device (24A) having an easy axis, wherein the easy axis of the free layer (16-17) is caused by shape elongation [see col. 12, line 1- col. 13, line 29].

Regarding claim 8, Daughton et al disclose the current sensing device (24A) is subjected to an additional magnetic field that can either be direct, varying or alternating [see Abstract].

Regarding claim 9, Daughton et al disclose the current sensing device (24A) having a pinned magnetic layer (19-20) with a magnetisation direction and a free magnetic layer (16-17) having an easy axis, wherein the magnetization direction of the pinned magnetic layer (19-20) is oriented at an angle, with the easy axis of the free magnetic layer (19-20), preferably between 45° and 135°, more preferred substantially perpendicular to the easy axis of the free magnetic layer (19-20) [see col. 12, lines 1- col. 14, line 24].

Regarding claim 15, Daughton et al disclose a flux concentrator (combination of contact enhancer 26A and electric field interrupter 26B) to increase the magnetic field at the location of the current sensing device (24A) [see col. 16, lines 20-62].

Art Unit: 2829

Regarding claim 16, Daughton et al disclose the flux concentrator (26A-26B) comprises a dummy MTJ stack (current sensor substructures 23A-23D) which is patterned around at least one vertical conduction component.

Regarding claim 17, Daughton et al disclose the flux concentrator (26A and 26B) is ring-shaped and comprises a gap between poles, the current sensing device (24A) being located in the gap.

Regarding claim 18, Daughton et al disclose the sensor device (24A) is compatible with CMOS or MOS processing [see col. 20, line 15- col. 22, line 15].

Regarding claim 19, Daughton et al disclose the semiconductor device (10) is an integrated circuit.

Regarding claim 20, Daughton et al disclose the current sensor or sensors are arranged to sense quiescent currents (IDDQ) or transient currents (IDDT) [see col. 20, line 15- col. 22, line 15].

Regarding claim 30, Daughton et al disclose a method for manufacturing a semiconductor device (semiconductor chip 10) according claim 3, the method comprising providing an MTJ stack (items 15-22 which forms current sensor 24D).

Regarding claim 31, Daughton et al disclose providing the MTJ stack (24D) comprises depositing a free region (ferromagnetic strata 16 and 17) [see col. 12, line 1- col. 13, line 29].

Regarding claim 32, Daughton et al disclose depositing a free region (16 and 17) comprises depositing an artificial anti-ferromagnetic free region comprising a plurality of anti-ferromagnetically coupled ferromagnetic layers [see col. 12, line 1- col. 13, line 29].

***Conclusion***

5. Claims 10-14 and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter: regarding claim 10, the primary reason for the allowance of the claim is due to semiconductor device comprising adjacent a first side of the current sensing device a first conductor for conveying a current to be measured and adjacent a second side of the current sensing device a second conductor for conducting current the first conductor and the second conductor crossing but not being electrically connected. Since claims 11-14 depend from claim 10, they also have allowable subject matter.

Regarding claim 33, the primary reason for the allowance of the claim is due to the method comprising modifying the net magnetic moment of the free region so as to make it non-zero.

Base on the above arguments and rejections above, the following is being applied.

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37



Art Unit: 2829

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jermele M. Hollington whose telephone number is (571) 272-1960. The examiner can normally be reached on M-F (9:00-4:00 EST) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ha Nguyen can be reached on (571) 272-1678. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jermele M. Hollington  
Primary Examiner  
Art Unit 2829

/J. M. H./  
March 16, 2009